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ABSTRACT

Noam Chomsky's theory of grammar, or more specifically his theory of syntax, proposes to describe all possible English sentences through an explanation of how the native speaker generates sentences. It is the study of one's competence that offers insights into how language is acquired and how the rules and generalizations of that language are internalized. Basic sentences are usually products of phrase-structure rules, while variations of basic sentences are products of transformational rules. Phonological and semantic applications must be made if one is to "pronounce" a sentence and get meaning from what is said or heard. If comprehension is the goal of reading, the reader must use his or her knowledge of language in general, and of transformations in particular, in order to translate printed symbols into the intended meaning. Although many studies offer specific suggestions for studying syntactic structure and increasing comprehension, it appears that the intuitive knowledge children have of their language is the best foundation upon which to build reading skills. In addition, the development of reading skills, especially comprehension, will be most effective if consideration is also given to the cues that exist within the flow of language and the similarity of the reading material to the oral language of the reader. (HOD)

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Chomsky, Syntax, and Reading: A Primer for Teachers

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Abstract: Provides an overview of Chomsky's theory of syntax, including the development of three models of linguistic structure. The relationship of syntax to memory, syntactic structures, transformations, and comprehension is explored. Implications for reading research and instruction are included.

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I. PRELIMINARY NOTIONS OF GENERATIVE-TRANSFORMATIONAL ASPECTS OF SYNTAX

Before one can completely understand the basic theory of syntax from Chomsky's point of view, several concepts must be defined or explained. This section will provide a brief overview of these important concepts. For the sake of brevity and clarity, each concept will be discussed independently, and then an attempt to relate and capsulize them will be made in the summary of this section.

Competency vs. Performance.

Chomsky (1965) makes a fundamental distinction between competence and performance. The speaker-hearer's knowledge of his language constitutes his competence, while the actual use of language in physical reality constitutes his performance. The importance of this distinction lies in the fact that Chomsky believes linguistic theory to be mentalistic; it is concerned with uncovering the mental reality of actual language behavior. Since the basis of his theories view grammar as dealing with "mental processes that are far beyond the level of actual or even potential consciousness," then it is clear that "generative grammar attempts to specify what the speaker actually knows, not what he may report about his knowledge" (1965, p. 8).

It is one's competence that accounts for the production and understanding of sentences never heard before. Chomsky points to the "openendedness" of human language, that is,

its potentially infinite creativity, and stresses the need for a linguistic theory capable of reflecting this characteristic. Since an accurate technique to describe this competence has not yet been discovered, Chomsky and his followers have utilized methods of symbolic logic to construct a theory of grammar.

Grammar.

Chomsky views grammar as a system of rules that describe a language at three component levels: phonologically, semantically, and syntactically. He states that the phonological and semantic components are "interpretive" since each "utilizes information provided by the syntactic component concerning formatives, their inherent properties, and their interrelations in a given sentence" (1965, p. 16). Although many writers use the terms grammar and syntax interchangeably, it is important to note that Chomsky's major contribution is in the sy tactic component of grammar. Perhaps the reason for some of the confusion of terminology is implied from Chomsky's explanation that the "grammar of a language is a complex system with many and varied interconnections between its parts. In order to develop one part of grammar thoroughly, it is often useful, or even necessary, to have some picture of the character of a completed system" (1957, p. 60).

Generative Property.

A generative grammar is said to "generate" all the possible sentences in a language. Such a grammar attempts

to account for the open-ended and creative nature of human language. That is, man can utter and understand an infinite set of sentences that he may have never heard. Therefore, his grammar must reflect the theory or system that allows him such abilities. Such a grammar allows one to distinguish between grammatical and ungrammatical sentences and to separate those that are ambiguous or synonymous. Since no one person actually produces all of the sentences of a language, the generative grammar is a reflection of the rules or generalizations about language which allows one to evaluate and understand novel sentences.

Transformations.

Simply defined, a transformation is a rule that adds to, deletes, or rearranges the various elements that occur in English sentences. Through these rules, one can convert one sentence structure into another.

Grammaticality.

Chomsky considers sentences to be grammatical if they are generated by the grammar. All sentences that do not conform to the rules for generating sentences are considered ungrammatical. This concept, however, relates to the syntactic system of English and not with style or rhetoric. It is also important to note that grammaticalness is related to one's competence as opposed to his performance. In short, grammaticality is to competence as acceptability is to performance.

Summary.

Chomsky's theory of grammar, and more specifically his theory of syntax, proposes to describe all possible English sentences through an explanation of how the native speaker generates sentences. By use of symbolic logic, he has developed a grammar that expresses the constituent elements of simple sentences in formulas and their more complex transformations in tree diagrams. As will be brought out in the next section, Chomsky eventually relates his theory of syntax to two additional components: phonological (sound) and semantic (meaning). The combination of these components offers the framework upon which language is developed and examined. Beyond this framework, however, lies the linguistic intuition of native speakers which accounts for their ability to understand and generate the sentences of their language. Since Chomsky believes that any theory of grammar should discover the mental reality of actual language behavior, his own theories are particularly converned with competence rather than performance. It is the study of one's competence that offers insights into how language is acquired and how the rules and generalizations of that language are internalized. The following section will trace the development of Chomsky's theory.

II. NOAM CHOMSKY: THREE MODELS OF LINGUISTIC STRUCTURE

In Syntactic Structures, Chomsky describes three models for linguistic structure: a simple, finite-state grammar;

a phrase structure grammar; and a transformational grammar. A discussion of the basic assumptions and limitations of each model will be the main focus of this section.

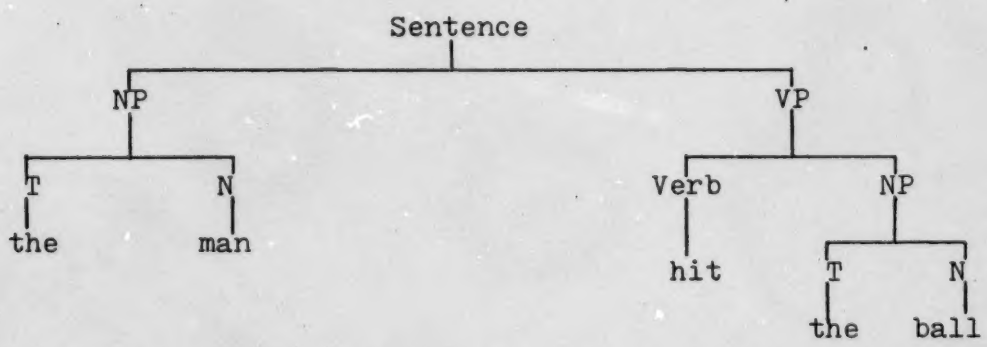
The Finite-State Model.

Since Chomsky considers a "language to be a set (finite or infinite) of sentences, each finite in length and constructed out of a finite set of elements," one can easily discover that English, as well as other natural languages, is an infinite set. This is so because phrases and sentences can be extended or generated indefinitely without any loss of acceptability by native speakers of the language. The simplest device for describing this infinite set would be a finite-state grammar. That is, a grammar that characterizes sentences as a sequence of items from left to right such that each subsequent item is conditioned by the immediately preceding choices or items. Such a model is based upon a finite vocabulary and a finite number of rules. Chomsky says that "if we can adopt [this model], we can view the speaker as being essentially a machine . . . . Each state which he passes represents the grammatical restrictions that limit the choice of the next word . . . ." He quickly adds that such a model lends itself to "serious difficulties and complications" since it cannot "produce all and only the grammatical sentences of English." Chomsky proved the inadequacy of a finite-state grammar by illustrating certain dependencies that exist between non-adjacent words and the interrelationships of these words when separated by a phrase or clause.

"If a grammar of this type produces all English sentences," says Chomsky, "it will produce many non-sentences as well." This would then account for the infinite number of sentences or questions that the model could not produce.

The Phrase Structure Model.

As Chomsky explains, "linguistic description on the syntactic level is formulated in terms of constituent analysis (parsing)." The words that comprise a sentence are described as its ultimate constituents since they cannot be further analyzed. This notion is called phrase structure and "is comparable to the . . . "bracketing" in mathematics or symbolic logic" (Lyons, p. 61). "An alternative, and equivalent, means of representing the labeled bracketing assigned to strings of elements generated by a phrase structure grammar is a tree diagram" (Lyons, p. 64). Chomsky (1957, p. 27) uses the following example:



Such a model of syntax formalizes the parsing of sentences by means of a system generative rules:

(1)	Sentence	→	NP + VP
(2)	NP	→	T + N
(3)	VP	→	Verb + NP
(4)	T	→	the
(5)	N	→	man, ball, etc.
(6)	Verb	→	hit, took, etc.

It is easy to see that this set of rules will produce only a small number of English sentences. In addition, the model cannot handle ambiguous sentences, nor can it distinguish sentences that have similar tree diagrams but represent different constructions. There is also difficulty when one tries to use the model to relate what will later be defined as transformations, and to exclude ungrammatical (or ambiguous) sentences.

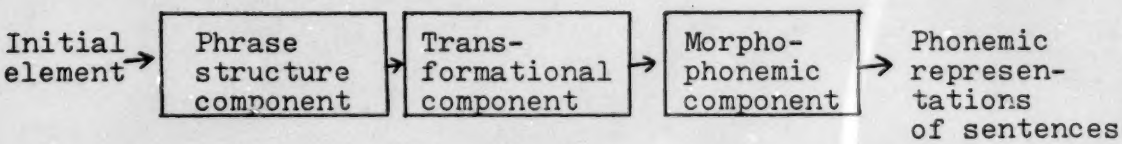
The Transformation Model.

One of Chomsky's main objectives in Syntactic Structures was to demonstrate the limitations of immediate constituent analysis. Not only was the "two-part divisional" aspect of phrase structure grammar too simplified, it did not give consideration to the native speakers' linguistic intuition (his competence). Such competency allows one to detect differences in meaning between sentences that are superficially similar, to distinguish between grammatical and ungrammatical utterances, and to perceive ambiguity and synonymity in utterances. In short, the phrase structure theory does not account for both the surface structure and the deep structure of sentences. Since meaning is contained within the deep

structure of a sentence, some device is needed to relate meaning to the surface level. This process is achieved through the application of transformations. Such a device is capable of changing one constituent structure into another as well as generating additional structures needed to form the desired surface structure.

In addition to the concept of transformations, Chomsky (1957) explains that the analysis of any sentence must include knowledge of the "reference and meaning of the morphemes or words of which it is composed" (p. 103-4).

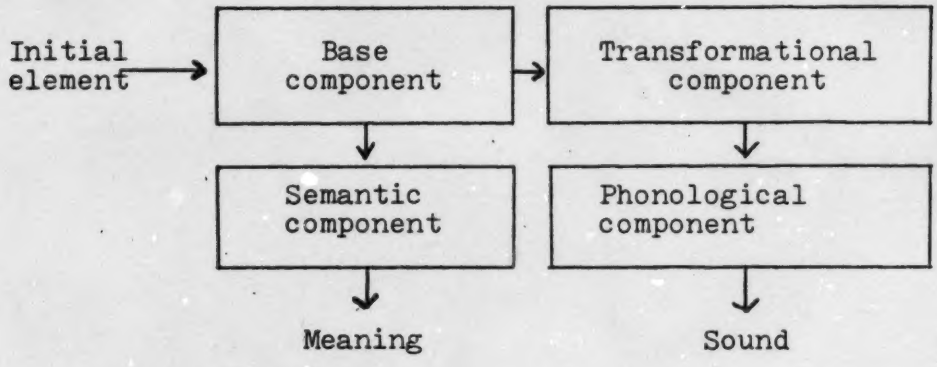
Arriving at such information is often expedited by checking the syntactic framework in which the unknown element occurs. This final stage, that is, the addition of the morphophonemic component, finally allows one to reach the phonemic representations of sentences. Lyons (p. 82) illustrates the model Chomsky develops in Syntactic Structures as follows:



In his book Aspects of the Theory of Syntax, Chomsky elaborates his transformational model. Lyons (p. 86-87) points out that the "most striking difference between the two grammars . . . is the additional 'box' of rules in the Aspects - type grammar labeled 'Semantic Component'." He continues to say:

> In the years that followed the publication of Syntactic Structures, Chomsky and his collaborators came to the conclusion that the meaning of sentences could, and should, be submitted to the same kind of precise, formal analysis as their syntactic structure, and that semantics should be included as an integral part of the grammatical analysis of languages.

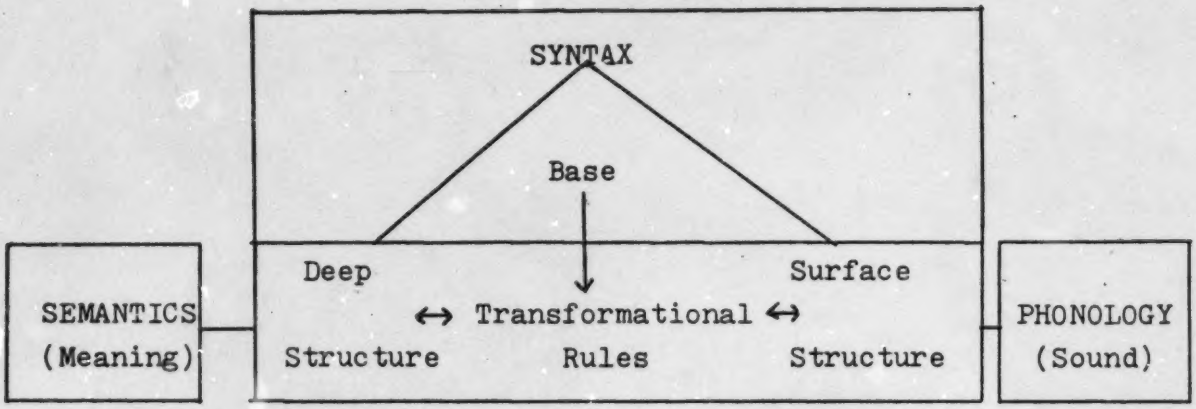
An additional modification is made in Aspects when Chomsky introduces the concept of "base rules." These rules are similar to his previous use of the phrase structure component, but he now explains that semantically relevant options are a function of the base of the grammar rather than the transformations. Again a diagram given by Lyon (p. 87) is helpful:



It now becomes clear that the semantic aspects of grammar are defined in terms of deep structure which is crucial to an understanding of the meaning of a sentence.

Summary.

To summarize what has been discussed as Chomsky's theory of transformational grammar, this simplified diagram is useful:



Syntax is obviously the means by which sound and meaning are related. Within the syntactic component, the deep structure and surface structure are related through the application of transformational rules. The application of various rules thus allows one to generate utterances: generative-transformational grammar. This framework views the speaker or writer as a sentence-producing mechanism. The sentences that are produced are classified as simple basic sentences (kernels) or variations of basic sentences (transformations). Basic sentences are usually products of phrase-structure rules, while variations of basic sentences are products of transformational rules. Finally, phonological and semantic applications must be made if one is to "pronounce" a sentence and get meaning from what is said (or heard).

III. SYNTAX AND READING

At this point we can assume that the generative-transformational model proposed by Chomsky comes closest to describing our language as it is used and understood by native speakers. We know that transformational rules allow us to relate deep structure to surface structure, and, with the

addition of phonological and semantic applications, we can get meaning from the input. However, several questions come to mind: Do transformations facilitate or impede comprehension? Do transformations overload memory? Does Chomsky's model have any implications for reading? Does a knowledge of syntactic structures effect comprehension? What factors must be considered in developing comprehension skills? This section will attempt to offer possible solutions (or viewpoints) to these questions.

Transformations, Comprehension, and Memory.

Several experiments have been conducted in order to measure the difficulty of comprehending sentences when transformations are varied or increased. Gough (1966) conducted two experiments that attempted to demonstrate the effects of delay and length upon the verification of sentences. The first study had subjects quickly decide if sentences presented to them were true or false based upon confirming or disconfirming pictures. "Subjects heard 128 sentences, constructed factorially (active-passive X affirmative-negative X true-false), each followed by a picture . . . and the latency of his decision (VT) was recorded." The results indicated that active sentences and affirmative sentences were verified faster than passive or negative sentences. This finding suggests that the hearer does not immediately decode complex sentences by transforming them into their underlying structure. Gough states that it is "possible that when verification cannot begin at once, [the subject]

simply holds a complex sentence in immediate memory until the evidence is presented, postponing the transformation process until then." Gough's second experiment was similar to the first except that passive sentences were made shorter than the active sentences, in addition to other minor alterations. Again, active sentences were verified faster. Gough concluded that "the relation of verification time to sentence structure is not an artifact of sentence length."

Fodor and Garrett (1967) conducted a series of experiments based upon the following assumptions:

> . . . the complexity of a sentence is a function not (or not only) of the transformational distance from its base structure to its surface structure but also of the degree to which the arrangement of elements in the surface structure provides clues to the relations of elements in the deep structure . . . . Sentences which are transformationally "close" to their deep structure sources are generally more richly grammatically elaborated than sentences which are transformationally distant from their deep structures. This is because, as we have seen, transformations tend to destroy structure.

The experimenters presented subjects with three lists of self-embedded sentences and sought to measure their perceptual complexity in terms of accuracy and time required for their paraphrase. Fodor and Garrett found that the presence of relative pronouns made the sentences (visually and auditorally) easier to understand. They then increased the length of the sentences by adding an adjective before each of the noun phrases. This alteration introduced three additional transformations so that each sentence now had six more

transformations than the original set. The results of the presentation showed no performance decrement. In light of their assumptions concerning the complexity of a sentence, Fodor and Garrett have demonstrated that the "consequent obliteration of the surface structure clues upon which the reconstruction of deep structure depends" tends to increase complexity rather than the increases in "transformational distance between base and surface structure."

Fagan (1971) investigated the effects of number and types of transformations upon the reading comprehension of fourth, fifth, and sixth grade pupils [I.R.A.'s 1971 Outstanding Dissertation]. After analyzing the transformations found in the reading passages and testing the pupils on comprehension, Fagan found that the presence and difficulty of transformations accounted more for sentence difficulty than passage difficulty. Fagan explained that information missed in one sentence may be acquired in another sentence (redundancy concept), therefore attributing to the ease of comprehending an entire passage.

He concludes that reading comprehension is affected by the type of syntactic structure found in printed language. Similar research by Ruddell (1965) likewise showed that increased structural redundancy contributed to the ease of comprehension.

Neisser (1967), attempting to summarize the findings of research on memory and grammatical structures, asks: "Do grammatical transformations really 'take up space' in

memory?". Although he states that "syntax is not the only variable which affects the way sentences are understood, remembered, and used," he does believe that "as the syntactic structure becomes more complicated, . . . it becomes a burden in its own right, and performance suffers accordingly." He further explains that each transform can be an independent burden on memory. Neisser goes on to describe the various theories of grammar that lead to Chomsky's transformational model. Realizing the complexity and "burdensome" nature of syntactical structures, he does, however, recognize the need for such a model:

> . . . if grammar turns out to be rich and intricate, and if its "generative" rules produce the very kind of structure the listener needs . . . [and] the more complex the rules of grammar are, the more likely it is that they not only describe the cultural constraints on the speaker, but also provide the vehicle of understanding for the listener.

The applicability of this statement to reading and writing is obvious. A grammar, such as that proposed by Chomsky, is necessary to describe the native speaker's (reader's) use and understanding of language--especially his ability to relate deep structure to surface structure. But how does this model relate to reading instruction?

Syntax and Reading.

It is almost universally accepted that reading is not reading, that is, it is not a completed act, until some level of comprehension has taken place. There is even greater "consensus among reading experts that reading comprehension

is dependent upon understanding how sentence structures deliver meaning" (Harris and Smith, 1972, p. 259). If comprehension is the goal of reading, then one could hardly refute the reader's need for an understanding of the syntactic relationships inherent in the passages he reads. Fortunately, children come to the task of learning to read with a well-formulated knowledge of language, including grammar. They have "discovered" the rules that control spoken language and they demonstrate their abilities by generating, pronouncing, and interpreting the language. Their major task in learning to read is to apply "these same rule-discovering skills" to the printed page (Smith, F., 1971).

As was discussed earlier, it is the deep structure of language that carries the meaning of written (and spoken) language. It was also pointed out that the function of transformational rules is to relate surface structure to deep structure. Therefore, the reader must use his knowledge of language in general, and of transformations in particular, in order to translate printed symbols into the intended meaning. F. Smith contends that "Transformational rules might appear to be the key for understanding how we can produce and comprehend language after all, despite the absence of a one-to-one correspondence between sound and meaning." He believes that transformational linguists would support the view that fluent readers must read directly for meaning since the individual words of a sentence or passage represent only the surface level. Neisser and F. Smith

are in agreement that readers remember only meaning or deep structure while their intuitive knowledge of language reconstructs approximations of surface structure. F. Smith also discusses the application of redundancy to reading, and explains that "more meaning can be extracted, and greater comprehension can be gained . . . if syntactic and semantic sequential redundancy" are utilized. Although he does not prescribe any specific methodology, Smith does emphasize that the teacher provide the "raw material" and allow children the chance to discover the features of written language for themselves. He concludes by listing information, feedback, and freedom to make mistakes as crucial components of learning to read.

Several other writers have offered suggestions for increasing comprehension ability based upon syntactic research. Fagan (1971) lists a series of exercises that may facilitate the understanding of printed language through the analysis of various structures and lexical items found within sentences. Robertson (1968) indicates a need to plan lessons that familiarize students with connectives since her research found those words to contribute to low reading comprehension. Deighton (1966) places emphasis upon the total flow of thought in English sentences. He illustrates the fact that "in a great many English sentences the flow of thought is not simply left to right but is in fact circular." Deighton cites a few clues that are helpful in distinguishing between the two types of sentences, in addition to calling attention

to the need of mature readers to be aware of the basic structures of sentences and their relationships to one another. Finally, Robert L. Allen (1964) has developed an approach that allows one to identify and relate elements of a sentence in order to recognize its structure and understand its meaning. His approach, "sector analysis", is based upon "feelings students already have for English as native speakers" and promises to be an effective method of teaching pupils to analyze and understand sentence units.

Summary.

An understanding of how sentence structure relays meaning is crucial to the comprehension of written language. Although many studies offer specific suggestions for studying syntactic structure and increasing comprehension, it appears that the intuitive knowledge children have of their language is the best foundation upon which to build reading (or any language) skills. Numerous studies (i.e.: Ruddell, 1965; Stevenson, 1965; Tatham, 1970;) have shown that comprehension is improved when reading materials become increasingly similar to the oral language already used and understood by children. Yet, as Strickland (1962) has shown, patterns of sentence structure found in children's textbooks are not in keeping with those children actually speak and understand. Structures in the textbooks are randomly and unsystematically introduced. In short, the development of reading skills, especially comprehension, will be most effective if consideration is given to (1.) the knowledge the reader already

has of his language, (2.) the cues that exist within the flow of language, and (3.) the similarity of the reading material to the oral language of the reader.

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